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A PROGRAM OF WATERFOWL RESTORATION

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THE HEREDITARY NESTING GROUND

The great hereditary nesting ground of the migratory waterfowl of North America is largely in Canada, though in the United States it constitutes a rectangular chunk of country some 300,000 square miles in extent. Here it stretches from the Canadian line southward to the Ruthaven Marshes in Iowa, the Nebraskan sand hills, and the Black Hills of South Dakota, northwest to Lake Bowdoin in Montana, and by the Des Lacs Lakes and the Turtle Mountains of North Dakota to Mud Lake in Minnesota.

A great breeding ground, it has had the three requisites for waterfowl existence. Prairie grasses have afforded the highest type of nesting cover. A thousand lakes and streams and a million snow-filled potholes formerly offered unlimited food and security. Enemies were few and casual and the isolation was perfect. Amid such surroundings many a brood of ducklings passed the summer and was on the wing before seeing a human being.

True to the traditional habits of the waterfowl, the winged legions have returned in tireless flight to this place of safety and subsistence year after year. Here their young have been reared. Here the motion of their countless wings has given animation to an otherwise motionless expanse. The ceaseless movements of the waterfowl are the essence of the prairie country. Century upon century it has been this way. Can man so work as to keep wings over the prairie in years to come?

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CONDITIONS IN THE SUMMER OF 1934

THE GREAT DROUGHT

Today, that part of the hereditary nesting ground of migratory waterfowl within the United States lies a veritable desert, forsaken by the birds. After the early, accustomed mobilization there in the spring, the ducks and geese perforce moved on into the upper Canadian prairie region, a natural continuation of that part of the nesting ground south of the international boundary line and not so desperately seared by the drought. A few gulls stayed to feed as usual on grasshoppers, and a thousand or so pelicans remained to nest, eking out a precarious existence on axolotl salamander larvae. The vast numbers of potholes and all but the deepest lakes were so dry that miniature whirlwinds of dust raced over their surfaces. Alkali deposits glistened in the sun. The water-table level sank out of reach of ordinary means of measurement. So little moisture was in the soil that eggs of sharp-tailed grouse would not hatch. Pheasant hens brought off broods of but 2 or 3 instead of the normal 6 to 10 active youngsters. The nesting efforts of the prairie chicken failed almost entirely.

The plight of man and his animals was scarcely less bearable. The seed he planted lay unsprouted in the soil. Then the unceasing prairie wind blew away both seed and topsoil. Fences choked with last season's tumbleweeds caught the escaping acres and were buried out of sight. Piles of loose dust lay over the roads, as deep and difficult to negotiate as snowdrifts. The atmosphere of distant cities, as far away as the Atlantic seaboard, was made murky with Dakota soil. Cattle, sometimes devouring discarded newspapers, wandered over the country, and fences were cut to facilitate their movements.

It was the lowly and despised Russian thistle that saved the day for many. In the feathery dry soil it still rooted, spreading its green over the sun-scorched earth and keeping the soil from complete wind erosion. Cattle resorted to it for food, and the desperate farmers cut many an acre of it for winter hay. Scarcely less astonishing was the manner in which the old range grasses took the opportunity presented by the drought to recover some of their ancient territory. Grama and buffalo grasses, freed from stifling competition of exotic weeds and grasses, reappeared in regions where they had not been seen for half a century.

RAVISHMENT OF THE NESTING GROUNDS

During the past half century many things have conspired to bring this part of the nesting grounds to their sad plight. The World War demand for wheat turned many a large pothole and slough of the Altamont moraine from producing ducks to producing wheat. The unbroken sod of many an upland bench and swale of the Coteau du Missouri—the watershed in this region between the Missouri and the Red Rivers—was first plowed in these wartime years and its priceless store of moisture greedily sucked up by the parched prairie wind. Winter snowfalls, about the only water the nesting area knows, became lighter. Potholes with water became scarcer. The annual spring run-off of the replenishing snow water became more inadequate, until in 1933 the water in the potholes and many lakes failed just before the young ducks were on the wing. Many perished miserably. The few predators finished the remainder. Few wild creatures are as safe as young ducklings on a well-watered slough or pothole with their normal, natural cover of reeds and marsh plants—few animals are more helpless when that environment fails them.

Large lake basins that formerly served to regulate the fluctuations of the water table by bank storage were drained to answer the cry for more grain, and marshes became heavily capitalized drainage districts. In many instances these ventures were unsuccessful, yet the natural ecological conditions were so changed that migratory waterfowl could not resume nesting there. Power developments made further inroads upon the nesting area. The great impetus given to road building in the last decade resulted in many a fine chain of canvasback and redhead nesting potholes being cut by road grades and inevitably drained.

THE LAST NORMAL NESTING SEASONS

The last of the normal nesting seasons in the prairie-breeding ground was in 1929. The 5 years of drought since then have struck the final blows. This nesting ground now lies a desert so far as its former millions of waterfowl are concerned. The sturdy human stock of the prairie lands will endure. Their herds will grow fat again. But can the earlier inhabitants, the winged millions, reestablish themselves in all their former abundance?

The thinking conservationist views the picture darkly. He sees 75 percent of the original nesting area in this country now under the plow or totally dried up. He sees remaining less than the 50 percent of the brood-stock reserves that the hunters should send back north each spring. He realizes that at least three species of ducks—the redhead, the ringneck, and the lesser scaup—are threatened with extinction, and that several other species are critically reduced. He knows that the agencies of destruction are strong and organized. He recalls that selfish interests have prevailed in the past. His apprehension sinks nearly to despair.

RESTORATION IDEA FAVORED BY RESEARCH

In his extremity the conservationist turns at last to that basic essential of human progress, science. Science has been busy all the while. Information about the winged denizens of our outlands has been studiously assembled. Widely scattered Government, State, institutional, and private investigators through untiring research have been pointing the way. Destructive agencies have been recognized, and international and local measures have been instituted to regulate hunting. The conservation forces thus had the fundamental equipment for work when the necessary funds should be found.

A NEW IMPETUS IN CONSERVATION

A MODERN STAMP ACT

The 1934 Congress enacted a stamp act, the Migratory Bird Hunting Stamp Act, which promises to make as much conservation history as its predecessor of colonial days made political history. Yet the funds it would provide are not adequate in themselves to institute the program contemplated by the leaders in the campaign for the restoration of waterfowl. A committee appointed by the President assembled a great mass of material on which future workers might base their efforts. It revealed the few remaining areas that should be made forever sacred to the needs of wildlife. It demonstrated that the Nation's economic status was such that the wildlife haunts, which had been turned into submarginal production, could be most safely and cheaply restored at this time.

BUREAU ENERGIES RELEASED UNDER NEW LEADERSHIP

When the present Chief of the Bureau of Biological Survey was appointed in 1934, he found this Bureau, the natural custodian of the Nation's wildlife resources, awaiting means to release its energies in the interest of wildlife restoration and management and to extend its functions in research. A program was quickly drawn up that, supported by an allotment of $8,500,000 from emergency funds, will enable the Biological Survey to continue as the leader in wildlife restoration and maintenance. Since early in the century the Survey had been urging the need for waterfowl sanctuaries. Considerable progress had been made, but appropriations had been too small and uncertain to institute such a program as was now ready for execution.

The Division of Migratory Waterfowl was organized on July 1, 1934, as a new unit in the Bureau to plan and develop the restoration program made possible by the increased funds. The program of upland-game-bird restoration had by this time been dropped and left to the States, inasmuch as Federal funds were not available for the restoration of such species and in view of the fact that the migratory waterfowl were in an extremity that was even greater.

PLANS FOR CONTINUOUS PRODUCTION-DEVELOPMENT OF REFUGES

The Mississippi flyway of the ducks and geese includes much of the country hardest hit by drought. So it was determined that the first restoration endeavor should be the reconditioning of this flyway, and the restoration of that part of the waterfowl nesting grounds that lies in the United States.

The curious minded will question why work should be begun on the nesting grounds first. They may ask, "Why not establish refuges in the heavy shooting districts of the middle parts of the United States?"

TREND OF WATERFOWL-CONSERVATION EFFORTS

To answer their queries there must first be reviewed the trend of waterfowl conservation efforts since spring shooting was outlawed by the Federal migratory bird law of 1913, and the Migratory Bird

Treaty Act of 1918. These acts were momentous steps in the right direction, but because of the inadequacy of the Survey's sanctuary system, it was necessary to rely almost entirely upon restrictions that would reduce the numbers of birds killed each year. Restricting open seasons, reducing bag limits, and prohibiting spring shooting resulted in a breeding remnant being sent back each year to the northern nesting areas. The next logical step was to supply the birds with the requisite breeding and resting grounds, as the Survey had been urging for nearly 30 years. It should be realized, however, that a continuation of reasonable gunning restrictions will always be necessary even after the successful completion of the refuge-restoration program.

Delay in undertaking adequate refuge restoration in the United States may be partly explained by the fact that funds have heretofore been lacking. The accomplishment of such a program calls for greater allotments of funds than were ever before made for the purpose. Justification of the nesting-ground-restoration program at this time, therefore, is seen in the fact that funds are now available for large-scale restoration. In almost every case this kind of restoration involves the expensive undertaking of impounding water.

GEOLOGY OF THE NESTING GROUNDS

The physical and biological factors that make the northwestern nesting grounds so productive should next be considered. Almost all the country it comprises has been heavily glaciated. The Coteau du Missouri of the physiographer is its backbone in this country. Its drainage is young and undeveloped. The nesting area begins on the east with gently rolling glacial-deposit plains. Westward it becomes successively a drift plain of rolling prairies, ending with the rugged, broken hills of the Coteau du Missouri with its numerous rough moraines, chief of which is the Altamont moraine. This entire area was once thickly studded with innumerable potholes, sloughs, and elevated lakes. Given snowfall, its waters can be made ample. Its rocky, morainal surface and a mean annual precipitation of only 16 inches are sufficient agricultural handicaps to make much of the country submarginal for crops. But it can be a waterfowl paradise. As its duck production in the past was the greatest in the United States, so does it now present the greatest restoration potentialities in this country as migratory-waterfowl breeding grounds.

Roughly speaking, west of the Missouri River in North Dakota, South Dakota, and Montana, the natural drainage becomes more highly developed and the duck-nesting possibilities are reduced to a minimum. The badlands of the Dakotas are practically duckless territory.

BIOLOGY OF NESTING AREAS

LONG HOURS OF SUNLIGHT

The biological factors in this area are scarcely less interesting. First consider the long hours of sunlight. There are fully 18 hours a day in which the ducks, young and old, can forage, and the young make prodigious growth. Young ducks must race against time in their development up to the flight stage. Normally many of the potholes dry up in midsummer, and for the ducklings to be caught by local drought before they can fly is fatal.

ABUNDANCE OF FOOD

Furthermore, the long hours of sunlight produce tremendous quantities of animal food in these waters. This production begins with fairy shrimp and scuds in earliest spring and progresses as summer wears on through stages of minnow, larval frogs, toads, and salamanders, and, considering the time involved, with snails, leeches, and aquatic-insect production in an abundance unknown in the waters of the East. Succulent water plants also appear magically. A young duck's rations are well balanced. They consist of animal and vegetable matter in proper proportion.

FEW ENEMIES

Enemies are very few on these nesting grounds. Cover is largely absent for the fox. The coyote does not like wet feet. The skunk rarely seeks a fare of duckling when the supply of grasshoppers is so convenient and inexhaustible. The very worst enemy of the duckling, the insidious and inescapable snapping turtle so prevalent in some other regions, is uncommon in most of the area, if not entirely absent. The night-marauding water snake is unknown. The various hawks present are chiefly the well-behaved, mousing species. The country is not sufficiently wooded to harbor many of the Cooper's and sharp-shinned hawks or the goshawks. Small wonder then that the great hereditary breeding grounds have stood as a beckoning haven of safety and sustenance to the travel-worn migratory waterfowl. Here they have always nested and fed in security. And when the time arrives late in summer for the annual shedding of the flight feathers, the adults have found here, in the sheltering banks of reed and cattail, the isolation they need at this critical flightless stage.

THE WATER SUPPLY ON THE BREEDING GROUNDS

THE ANNUAL RUN-OFF

The annual snow-water run-off is the chief source of water for this great expanse of country. The effect of seasonal rainfall on water levels is negligible. The greater part of the accumulated winter snowfall runs off in the first 100 to 150 hours after the earliest chinooks come over the Coteau du Missouri. A whole season's supply of moisture goes raging down the flat river valleys, the coulees, and the dry runs. Part of it fills the potholes, depressions, and river-bed lakes, but the remainder hastens to the turbid Missouri and sluggish Red River to increase flood menace and destruction downstream.

HIGH EVAPORATION

Further, the annual evaporation rate is around 4 feet per acre of water surface. These peculiarities attending evaporation and run-off dictate the development of a system of nesting refuges with necessary storage dams. By drawing upon the impounded supply of water, constant water levels can be maintained in the nesting marshes created in the broad valleys below the dams. This is a biological necessity, both on the breeding areas in this country and on areas to the north, and, supplemented by adequate regulation of hunting, it is essential if duck production is to be undertaken in any degree commensurate with the objective of keeping the thinning ranks of these waterfowl from complete decimation at the hands of the increasing thousands of duck hunters.

TYPICAL STORAGE POSSIBILITIES

It should be understood, of course, that all the refuges established will automatically serve as feeding and resting refuges to the adult ducks during migrations as well as when they are producing their annual crop of young. To demonstrate the restoration policy, a typical major nesting refuge project may be considered, such as the Jim and Arrowood Lakes Refuge on the James River, above Jamestown, N. Dak. The annual run-off on the James River is erratic, but careful hydraulic surveys reveal that 30,000 to 300,000 acre-feet can be counted upon. The storage possibilities on either Arrowood or Jim Lake are unlimited, being much greater than any run-off that will ever be attained there. It is planned, by suitable dams, to store some 50,000 acre-feet on Arrowood Lake and probably 70,000 to 90,000 acre-feet more on Jim Lake. The 4 miles of low, intervening river valley between the two lakes will be reconverted into its original famous nesting marsh. This will be accomplished by cross dikes of earth and will also serve to restore the intermediate Mud Lake, once a famous canvasback- and redhead-breeding area.

An additional 5,000 acres of nesting marsh will be created in the river valley below the lowermost storage dam at Jim Lake. When the water level of this marsh starts falling, water will be drawn from the storage basin to maintain constant levels and compensate for evaporation losses. It is also planned by experimentation to determine the optimum depth at which these marshes should be maintained. For example, it may be found that as many ducks can be raised by maintaining 6 inches of water in the marsh as by holding a depth of 3 feet.

RESERVE SUPPLY FOR DROUGHTS

The water supply will be conserved as much as possible. In fact, inasmuch as the James River run-off is rather variable, it is hoped that it may be possible to pyramid the water supply so that the unused surplus of each year's run-off can be carried over, to the end that there will be enough reserve acre-feet to maintain duck production to a large degree if not at the maximum, during some future comparable drought period.

SNOW FENCES

During snowstorms the snow is blown miles across the level prairie before it finally comes to rest. To cause even a greater quantity of snow to be deposited on the project watershed, a system of snow fences has been devised. At first these fences must necessarily be composed of wood, but as speedily as possible such shrubs as the round-leaved shadbush, the silverberry, the diamond willow, and other native species will be planted to take the place of the artificial snow fences. Thus not only will the water supply be greatly augmented, but ground storage will be so developed that the holdings can be planted with native forest trees. In the northwest drought area of 1934 it was to be observed that artificial groves that had much undergrowth of shrubs came through the critical period with scant losses, while in groves without the shrubs the destruction was near 100 percent. These shrubs had caught last season's snowfall, scant as it was, and caused moisture to seep into the ground locally. Incidentally, since some of the larger refuges will be within the proposed Great Plains shelter belt of the Forest Service, it is planned to correlate the plantings with those of that project.

MILLIONS OF DUCKS ANNUALLY

Twelve great nesting refuges have thus far been planned, with a combined area of some 300,000 acres. It is not unreasonable to expect that these refuges when finally conditioned and populated may annually produce several millions of ducks. It is estimated that within this generation the production on the entire north-central breeding area was 30,000,000 annually.

The prairie-nesting grounds within the United States ordinarily produce more ducks per acre than any other area in the country. Other studies indicate that the greatest density of upland game birds in the best possible environment is but one bird to the acre. More often the range is one bird to 4 to 20 acres, depending upon the environment. Fortunately the population density of waterfowl is quite different. One good diving-duck slough in the Coteau du Missouri or the Dakota Drift Plain area will average five broods per acre, and the broods run large. There was a 10-acre slough in the famous Waubay Lakes country that produced 600 redheads year in and year out until it went dry in the season of 1933. The mallards and teals are probably little, if any, behind this production rate.

Contrast this performance with the production rate in eastern Minnesota, Wisconsin, Michigan, and the New England States. In those areas the black duck is the chief nesting species. There the best will rarely average over one brood per acre. Counts made by the writer on more than a hundred beaver dams and small lakes in upper Michigan showed an average of one brood per acre—a beaver pond in the first 3 years of its existence is much richer in food and cover than many natural coverts. In the black-duck areas there is a further reducing ecological factor in the form of a deadly duck parasite that is transmitted by the bite of the black fly. At times it destroys whole broods of young black ducks. This menace is largely absent from the prairie nesting grounds.

UPLAND SPECIES BENEFIT INCIDENTALLY

Since many mallards, pintails, and other river ducks normally nest at considerable distances from water—sometimes as much as a mile—a sufficient area of upland country must necessarily be obtained around each refuge to satisfy this need. The cover preferred by these nesting ducks is the natural prairie grasses. On the upland areas of most of the selected refuge sites there now exists a splendid upland-bird population. Most refuges in process of acquisition now have the native sharp-tailed and pinnated grouse, and many have Hungarian partridges as well as ring-necked pheasants.

One great area selected for a refuge is unique in that it has three species of native grouse. Its sandhill area has ruffed grouse; its open country and old fields supply haunts for the prairie chicken; and the hill and coulee country along its boundaries is heavily populated with sharptails. It is needless to point out that these and other nonmigrants, as well as all species of migratory birds, will receive sanctuary, food, and encouragement on these refuges. Many species of mammals also frequent them, including beavers, muskrats, deer, cottontails, jack rabbits, porcupines, raccoons, skunks, and a number of others. In other words, the local cause of upland-game and fur conservation will be greatly advanced wherever these refuges are established.

RESTING AND FEEDING REFUGES NOT FORGOTTEN

Finally, in planning refuges on the breeding grounds of migratory waterfowl, the need for resting and feeding refuges along their flyways has not been overlooked. This type of refuge has been planned with due regard to the lines of flight, points of concentration, and places of overshooting. It is proposed to save in each area where heavy shooting occurs, a breeding supply of ducks to be sent back north each spring to the great hereditary nesting grounds. It is anticipated that ultimately there will be adequate resting and feeding grounds every hundred miles down the Mississippi flyway.

Regarding the accomplishments at other places thus far, sportsmen and conservationists will rejoice to learn that there have now been purchased the 50,000-acre Mattamuskeet Lake in North Carolina, a 45,000-acre refuge in the White River country of Arkansas, and the famous P Ranch of about 65,000 acres and its water rights in the Donner and Blitzen River Valley, in Oregon, which will enable the Survey to restore that incomparable and ancient home of the Pacific-coast waterfowl, Lake Malheur. Numbers of other refuge sites are being negotiated for, with the goal set at a million acres of migratory waterfowl refuges by 1940.

TRAINED ENGINEERS AND BIOLOGISTS DEVELOP SITES

In undertaking such an enormous restoration program, the first precautionary measure and guarantee of success was the selection of trained and efficient personnel. It was determined that not only should the ducks get a dollar's value for every dollar expended, but also the sportsmen, who in future will pay that fee for their migratory-waterfowl stamps. The country was combed for the highest type of hydraulic engineers. The watershed and run-off pertinent to every proposed refuge site were carefully and critically studied by these men before that site was adopted. Every area selected in the drought region had a water supply that had come safely through this critical period.

Each project then had to qualify further in regard to its past history as an area that waterfowl had used in the earlier time of their prosperity. In this capacity the aid of the Biological Survey's staff of trained ornithologists experienced in the geographic distribution and migratory habits of birds was enlisted as well as its biologists skilled in the knowledge of the food habits and feeding requirements of the various species, these latter making exhaustive food studies on every site and passing upon its food resources and cover.

An enlarged force of trained refuge-site reconnaissance men had to be obtained and developed. To aid in this feature of the work the national organizations of sportsmen made several of their field men available. Land purchasing is done after classification of its character and worth by the Bureau's experienced force of skilled land-acquisition negotiators.

SUPPORT OF PUBLIC OFFICIALS

Conservationists everywhere—officials, individuals, and organizations—have evinced a spontaneous and helpful spirit of cooperation. State game and fish departments and local agencies interested in wildlife have given assistance on every hand, and the public has shown a sympathetic interest in the work. With such cooperation, assistance, and support continuing, the national program of wildlife restoration will make it possible once again for the waterfowl of this continent to occupy their great hereditary nesting grounds in numbers approaching their former abundance.

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